Appl. No. 10/691,173
Examiner: TRAN, MAI HUONG C, Art Unit 2818
In response to the Office Action dated March 8, 2005

Date: June 8, 2005
Attorney Docket No. 10113081

REMARKS

Applicant thanks the Examiner for acknowledging Applicant's claim to foreign priority and receipt of the certified copy of the priority document. Responsive to the Office Action mailed on March 8, 2005 in the above-referenced application, Applicant respectfully requests amendment of the above-identified application in the manner identified above and that the patent be granted in view of the arguments presented. No new matter has been added by this amendment.

Present Status of Application

Claims 1-6, 9-10, and 12-13 stand rejected under 35 U.S.C. 102(e) as being anticipated by Sommer et al (US 6,770,928). Claims 7 and 11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sommer et al in view of Cappelani et al (US 6,800,898). Claims 14-42 are withdrawn from consideration. The specification is objected to.

In this paper, claim 1 is amended to include the limitations of claim 7 and further recite that the oxide is a thermal oxide. Support for the amendment can be found on page 8, lines 5-19 and Figs. 6 and 7 of the application. The specification is amended according to the suggestions of the Examiner and to correspond with the claims. Claims 7 and14-42 are canceled. Thus, upon entry of this amendment, claim 1-6 and 8-13 are pending.

Reconsideration of this application is respectfully requested in light of the amendments and the remarks contained below.

Rejections Under 35 U.S.C. 103(a)

As amended, claim 1 recites the limitations of original claims 1 and 7 and further recites that the oxide is a thermal oxide. Original claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Sommer et al in view of Cappelani et al. To the extent that the grounds of the rejection may be applied to the claims now pending in this application, they are respectfully traversed.

Amended claim 1 recites a memory device with vertical transistors and trench capacitors comprising a diffusion barrier, deposited on one side of the sidewall of the deep trench and

between the second conductive layer and the substrate of the deep trench, comprising a thermal oxide. By way of example, in the specification, an oxidation S600 is performed in the sidewall and the bottom of the trench 104 by thermal oxidation at a temperature of about 900~1000 °C. After the oxidation S600, a thin oxide layer 126a is formed on the bottom and one side of the sidewall of the trench 104 which is the nitridation area, and a thick oxide layer 126b is formed on the other side of the sidewall which is not in the nitridation area. Parts of the oxide layer 126a, 126b are removed by wet etching containing HF solution to leave the thick oxide layer 126b, such that the thick oxide layer 126b serves as a diffusion barrier on only one side of the sidewall of the deep trench 104 above the ring shaped insulator 120. See page 8, lines 5-19 and Figs. 6 and 7 of the application.

Neither Sommer et al nor Cappelani et al, when taken alone or in combination, teach or recite a memory device with vertical transistors and trench capacitors comprising a diffusion barrier, deposited on one side of the sidewall of the deep trench and between the second conductive layer and the substrate of the deep trench, comprising a thermal oxide, as recited in claim 1.

MPEP 2142 reads in part:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In connection with the third criteria, MPEP 2143.03 goes on the state:

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of

that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

Sommer et al teach a semiconductor memory in which the covering layer 30 is formed as a nitride layer. Moreover, the covering layer 30 on the right-hand side is taken as far as the collar layer 12, such that a buried strap region 31 is produced only on one side of the trench 5. See col. 5, lines 3-10 and Fig. 6 of Sommer et al. Thus, Sommer et al teach that the covering layer 30 is formed as a nitride layer, rather than an oxide layer.

Cappelani et al teach an integrated circuit configuration, in which the diffusion barrier may be composed of insulating material. The insulating material may be, for example, SiO2 or silicon nitride. See col. 4, lines 20-23 of Cappelani et al. However, the diffusion barrier disclosed by Cappelani et al is not, and ***cannot*** be, a thermal oxide. As shown in Fig. 2, if the layer S (for formation of the diffusion barrier) were formed by thermal oxidation, a thermal oxide layer would be simultaneously formed over the sidewall (on the left-hand side) of the depression V. As a result, the source/drain region S/Du (buried strap) could not be formed in the subsequent processes because the thermal oxide formed on the sidewall of the depression V bars the dopants in the conductive structure L2 from out-diffusing. Thus, Cappelani does not teach or suggest the diffusion barrier is a thermal oxide.

For at least these reasons, it is Applicant's belief that Sommer et and Cappelani et al, even when taken in combination, fail to teach or reasonably suggest all of the limitations recited in claim 1. Accordingly, Applicant respectfully submits that claim 1 is in condition for allowance. Insofar as claims 2-6 and 8–13 are dependent claims that incorporate the limitations of claim 1, Applicant respectfully requests that these claims also in condition for allowance.

Conclusion

The Applicant believes that the application is now in condition for allowance and respectfully requests so.

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Respectfully submitted,

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